

REMARKS

The Office Action mailed October 24, 2002, has been received and reviewed. Claims 1 through 26 are currently pending in the application. Claims 1 through 26 stand rejected. Claims 1 through 17 have been objected to regarding informalities. Applicants have amended claims 1, 10, 18 and 24, and respectfully request reconsideration of the application as amended herein.

Objections to Claims 1 through 17/Allowable Subject Matter

Claims 1 through 17 stand objected to because in claim 1, penultimate line, the term "frame." is grammatically incorrect. Applicants have determined that, due to a clerical error, claim language was improperly inserted at the end of claim 1 in a previous amendment (*see* Applicants' Amendment dated February 25, 2002). Applicants have amended claim 1 to remove the claim language and correct the problem.

35 U.S.C. § 112 Claim Rejections

Claims 1 through 17 stand rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Applicants respectfully traverse this rejection, as hereinafter set forth.

Applicants have amended claim 1 as suggested by the Examiner to particularly point out and distinctly claim the subject matter of the invention. In light thereof, Applicants respectfully request the withdrawal of the 35 U.S.C. § 112, second paragraph, rejection of claims 1 through 17 and thereafter solicit the allowance of the claims.

35 U.S.C. § 103(a) Obviousness Rejections

Obviousness Rejection Based on U.S. Patent No. 5,089,878 to Lee in view of U.S. Patent No. 5,012,323 to Farnworth

Claims 1 through 10 and 13 through 26 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Lee (U.S. Patent No. 5,089,878) in view of Farnworth (U.S. Patent No. 5,012,323). Applicants respectfully traverse this rejection, as hereinafter set forth.

M.P.E.P. 706.02(j) sets forth the standard for a Section 103(a) rejection:

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). (Emphasis added).

The 35 U.S.C. § 103(a) obviousness rejections of claims 1 through 10 and 13 through 26 are improper because they fail to establish a *prima facie* case of obviousness.

Turning to the references cited in the instant rejection, Lee discloses a low impedance integrated circuit package. The integrated circuit package comprises a circuit chip 2 disposed on a support paddle 10 of a lead frame 8 (Figs. 1a-1c). Lead frame 8 is depicted as having a number of leads extending from the four sides of support paddle 10, including ground leads 12a and power leads 12b (col. 3, lines 23-30). A dielectric layer 16 is provided above the leads, and a plurality of trapezoidal metal coupons 18a and 18b are positioned over dielectric layer 16 to provide low impedance paths for ground leads 12a and power leads 12b, respectively (col. 3, lines 36-51). Coupons 18a and 18b are connected to leads 12a and 12b via wirebonds or other conductive elements (Fig. 1c). Coupons 18a and 18b are separated from one another by decoupling capacitors 28 (Fig. 1a and col. 4, lines 5-13).

Farnworth teaches a double die semiconductor package having a back bonded die and a face bonded die interconnected on a single lead frame. In the background of the invention, Farnworth discusses prior art lead frame systems which overcome the constraints of a standard lead frame having a die bonding paddle (col. 1, line 62 - col. 2, line 38). In the first system, a die is back bonded to extensions of the individual lead frame leads (col. 2, lines 18-24). In the second system, a die is face bonded to the leads of the lead frame (col. 2, lines 24-32). Farnworth further describes two lead frame layouts for these systems: the first comprising a dual row, inline-lead embodiment, and the second comprising a single row inline-lead embodiment (Figs. 2 and 3 and col. 2, line 39 - col. 3, line 47).

Applicants respectfully submit that Lee and Farnworth, either alone or in combination, fail to teach or suggest all of the claim limitations of amended claims 1 through 10 and 13 through 26.

As amended herein, claim 1 recites the limitations of “[a] first voltage reference plane *underlying* at least a portion of said first group of lead fingers extending from said first side of said semiconductor die”, and “[a] second voltage reference plane *underlying* at least a portion of said second group of lead fingers extending from said second opposing side of said semiconductor die.” (Emphasis added.) These limitations are supported in the specification, as filed, at page 7, paragraph [0022]. The combination of Lee and Farnworth does not disclose these limitations. Rather, the coupons 18a and 18b of Lee are depicted and described as being located *above* dielectric layer 16 and leads 12. (Lee at Figs. 1a-1c, 3a-3b and 9-9d, and col. 3, lines 36-44, col. 4, lines 43-48 and col. 6, lines 13-16.) Accordingly, claim 1 is allowable over the combination of Lee and Farnworth under the provisions of 35 U.S.C. § 103(a).

Claims 2 through 10 and 13 through 17 are also allowable as depending from claim 1. If an independent claim is nonobvious under 35 U.S.C. 103, then any claim depending therefrom is nonobvious. *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988).

Moreover, claim 7 recites the limitation wherein “said lead frame includes a die-attach paddle to which said semiconductor die is attached” and claim 8 recites the limitation wherein

"said die-attach location comprises a die-attach paddle." The lead frames of Farnworth do not have die-attach paddles and, in fact, teach away from this limitation. Farnworth views die-bonding paddles in conventionally designed lead frames as being detrimental to miniaturization, and therefore prefers "improved" lead frame systems that omit die-attach paddles. (Farnworth at col. 1, line 62 - col. 3, line 35.) As such, one of ordinary skill in the art would not be motivated by the teachings of Farnworth to include a die-attach paddle as recited in claims 7 and 8.

Claim 10 has also been amended to recite the limitation of "a plurality of projections extending outwardly from a surface of said at least one of said first voltage reference plane and said second voltage reference plane." Claim 17 recites the limitation of an adhesive structure comprising "an insulating film having an adhesive on opposing surfaces thereof." Neither Lee nor Farnworth teach or suggest these limitations.

As amended herein, claim 18 recites the limitations of "[a] first voltage reference plane extending across at least a turning portion of said first group of lead fingers", "[a] second voltage reference plane extending across at least a turning portion of said second group of lead fingers", and "an intervening neck extending across said another, single side of said lead frame and *conductively connecting* said first voltage reference plane and said second voltage reference plane." (Emphasis added.) The combination of Lee and Farnworth does not disclose these limitations. Specifically, the coupons 18a and 18b of Lee comprise distinct elements that are separated by decoupling capacitors 28 (Lee at Figs. 1a and 9a). It is further submitted that there would be no reasonable expectation of success to conductively connect the coupons 18a and 18b of Lee, as recited in claim 18. Coupons 18a are connected to ground leads 12a and coupons 18b are connected to power leads 12b (Lee at col. 3, lines 42-44). Conductively connecting coupons 18a and 18b would cause a short circuit between the ground and power leads, and would render the device inoperable. Accordingly, claim 18 is allowable over the combination of Lee and Farnworth under the provisions of 35 U.S.C. § 103(a).

Claims 19 through 26 are also allowable as depending from claim 18.

Moreover, claims 22 and 23 recite the limitation of "a die-attach paddle", and claim 26 recites the limitation of an adhesive structure comprising "an insulating film having an adhesive on opposing surfaces thereof." For the same reasons as discussed above, neither Lee nor Farnworth teach or suggest these limitations.

In sum, Applicants respectfully submit that claims 1 through 10 and 13 through 26 are allowable over Lee and Farnworth and request the withdrawal of the rejections of these claims under 35 U.S.C. § 103(a).

Obviousness Rejection Based on U.S. Patent No. 5,089,878 to Lee in view of U.S. Patent No. 5,012,323 to Farnworth, and further in view of U.S. Patent No. 5,583,377 to Higgins

Claims 11 and 12 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Lee (U.S. Patent No. 5,089,878) in view of Farnworth (U.S. Patent No. 5,012,323) as applied to claims 1 through 10 and 13 through 26, and further in view of Higgins (U.S. Patent No. 5,583,377). Applicants respectfully traverse this rejection, as hereinafter set forth.

Claims 11 and 12 depend from claim 10 which, in turn depends from claim 1. Claim 1 recites the limitation of "[a] first voltage reference plane *underlying* at least a portion of said first group of lead fingers extending from said first side of said semiconductor die", and "[a] second voltage reference plane *underlying* at least a portion of said second group of lead fingers extending from said second opposing side of said semiconductor die." (Emphasis added.) As previously discussed, the combination of Lee and Farnworth does not disclose these limitations, because the coupons 18a and 18b are only disclosed as being positioned *above* leads 12. Claims 11 and 12, which incorporate the limitations of claim 1, are accordingly allowable over Lee and Farnworth.

Applicants further submit there is no suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or combine reference teachings as presented in the instant application. Higgins et al. discloses a heat sink 48 which is combined with Lee and Farnworth to provide the limitations

of the reference plane projections recited in claims 10, 11 and 12. All of the heat sinks disclosed by Higgins et al. are intended to be of a size sufficient to provide a die receiving cavity for holding a semiconductor die (col. 2, lines 17-23). The coupons 18a and 18b of Lee, on the other hand, are described as comprising a "thin metal foil" (col. 6, lines 37-40). Due to the significant structural and functional differences between the heat sink 48 of Higgins et al. and the coupons 18a and 18b of Lee, it would not be obvious to combine the two to achieve the structural features recited in claims 10, 11 and 12 of Applicants' invention. Rather, Applicants respectfully submit that the Office has impermissibly relied on the hindsight benefit of Applicants' own disclosure to construct the claimed invention. *See, e.g., Grain Processing Corp. v. American-Maize Prods. Co.*, 5 U.S.P.Q.2d 1788, 1792 (Fed. Cir. 1988).

In view of the above, Applicants respectfully submit that claims 11 and 12 are allowable over Lee, Farnworth and Higgins et al. and request the withdrawal of the rejections of these claims under 35 U.S.C. § 103(a).

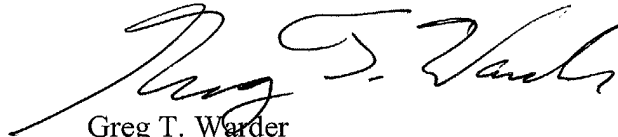
ENTRY OF AMENDMENTS

The amendments to claims 1, 10, 18 and 24 above should be entered by the Examiner because the amendments are supported by the as-filed specification and drawings and do not add any new matter to the application.

CONCLUSION

Claims 1 through 26 are believed to be in condition for allowance, and an early notice thereof is respectfully solicited. Should the Examiner determine that additional issues remain which might be resolved by a telephone conference, he is respectfully invited to contact Applicants' undersigned attorney.

Respectfully Submitted,



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Enclosure: Version of Claims with Markings to Show Changes Made

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VERSION OF CLAIMS WITH MARKINGS TO SHOW CHANGES MADE

1. (Four Times Amended) A semiconductor die assembly comprising:
 - a semiconductor die having a plurality of bond pads on an active surface thereof;
 - a lead frame having at least a first group of lead fingers and a second group of lead fingers to respectively extend from first and second opposing sides of said semiconductor die attached to a die-attach location on said lead frame to another, single side of said lead frame in a substantially mutually parallel configuration;
 - a first voltage reference plane adjacent to said first side of said semiconductor die [to overlie in immediate proximity to therefrom], said first voltage reference plane [overlying] underlying at least a [turning] portion of said first group of lead fingers extending from said first side of said [die-attach location] semiconductor die toward said another, single side of said lead frame; and
 - a second voltage reference plane adjacent to said second opposing side of said semiconductor die [to overlie in immediate proximity to said second group of lead fingers and in electrical isolation therefrom], said second voltage reference plane [overlying] underlying at least a [turning] portion of said second group of lead fingers extending from said second opposing side of said [die-attach location] semiconductor die toward said another, single side of said lead frame. [said first group of lead fingers and in electrical isolation]
10. (Amended) The assembly of claim 1, wherein at least one of said first voltage reference plane and said second voltage reference plane includes a plurality of projections extending outwardly [away] from [a direction of said immediate proximity of] a surface of said at least one of said first voltage reference plane and said second voltage reference plane [said first group of lead fingers and said second group of lead fingers, respectively].

18. (Three Times Amended) A vertical surface mount lead frame to be assembled to a semiconductor die, comprising:

a lead frame having at least a first group of lead fingers and a second group of lead fingers to respectively extend from first and second opposing sides of an intended die-attach location to another, single side of said lead frame in a substantially mutually parallel configuration;

a first voltage reference plane [to overlie] in immediate proximity to said first group of lead fingers and in electrical isolation therefrom, said first voltage reference plane [overlying] extending across at least a turning portion of said first group of lead fingers extending from said first side of said intended die-attach location toward said another, single side of said lead frame; [and]

a second voltage reference plane [to overlie] in immediate proximity to said second group of lead fingers and in electrical isolation therefrom, said second voltage reference plane [overlying] extending across at least a turning portion of said second group of lead fingers extending from said second opposing side of said intended die-attach location toward said another, single side of said lead frame; and

an intervening neck extending across said another, single side of said lead frame and conductively connecting said first voltage reference plane and said second voltage reference plane.

24. (Twice Amended) The assembly of claim 18, wherein said first voltage reference plane and said second voltage reference plane extend [over] across at least about fifty percent of a surface area of said at least said first group of lead fingers and said second group of lead fingers, respectively.